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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KIYOSHI SATOH, KAZUO SATO, and
HIDEAKI FUKUDA

Appeal 2009-012845
Application 10/759,953
Technology Center 1700

Decided: June 17, 2010

Before ADRIENE LEPIANE HANLON, CHUNG K. PAK, and
TERRY J. OWENS, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL
STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-3, 5, 6, 8-10, 14-19 and 45. Claims 11-13, which are all of the other pending claims, stand withdrawn from consideration by the Examiner. We have jurisdiction under 35 U.S.C. § 6(b).

The Invention

The Appellants claim a chemical vapor deposition device. Claim 9 is illustrative:

9. A chemical vapor deposition (CVD) device comprising:
a deposition reaction chamber;
a plasma discharge chamber that is provided remotely from the reaction chamber; wherein the plasma discharge chamber comprises 1) a wall that comprises an aluminum alloy, wherein the wall is exposed to plasma discharge, and 2) a radio-frequency (RF) energy source connected to plasma discharge chamber electrodes;
a source of a cleaning gas, wherein the source of the cleaning gas is connected to the plasma discharge chamber;
a piping that links the reaction chamber and the remote plasma discharge chamber: and
a valve positioned in the piping, wherein an opening of the valve is sized, when fully opened, substantially equal in width to an inner surface of the piping, and the valve does not have projections, when fully opened, with respect to the inner surface of the piping,
wherein energy coupled to the remote plasma discharge chamber activates cleaning gas within the plasma discharge chamber, and the activated cleaning gas is exposed to the aluminum alloy wall and brought into the inside of the reaction chamber through the piping and changes solid substances adhered to the inside of the reaction chamber as a consequence of film formation, to gaseous substances, thereby cleaning the inside of the reaction chamber.

The References

References relied upon by the Examiner

Hackman	3,963,214	Jun. 15, 1976
Lorimer	5,069,938	Dec. 3, 1991
Fong	5,812,403	Sep. 22, 1998
Ikeda	6,033,479	Mar. 7, 2000
Noble	6,450,116 B1	Sep. 17, 2002
Iyer	6,498,109 B2	Dec. 24, 2002

References relied upon by the Appellants

Shang	5,788,778	Aug. 4, 1998
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Rajagopalan	6,274,058 B1	Aug. 14, 2001
Sun	2002/0033183 A1	Mar. 21, 2002
Fukuda	2005/0139578 A1	Jun. 30, 2005
	(effective filing date Feb. 24, 2000)	
Yin	WO 99/20812	Apr. 29, 1999

The Rejections

The claims stand rejected under 35 U.S.C. § 103 as follows: claims 1-3, 5, 6, 8, 9, 15, 16 and 45 over Fong in view of Lorimer and Iyer; claim 10 over Fong in view of Lorimer, Iyer and Ikeda; claims 14 and 17-19 over Fong in view of Lorimer, Iyer and Noble; claims 1-3, 5, 6, 8, 9, 15, 16 and 45 over Fong in view of Lorimer, Iyer and Hackman; claim 10 over Fong in view of Lorimer, Iyer, Hackman and Ikeda; and claims 14 and 17-19 over Fong in view of Lorimer, Iyer, Hackman and Noble.

OPINION

We affirm the rejections.

Issue

Have the Appellants indicated reversible error in the Examiner's determination that the applied prior art would have rendered prima facie obvious, to one of ordinary skill in the art, a valve which is positioned in piping which links a CVD reaction chamber and a remote plasma discharge chamber and, when fully open, 1) has an opening defining a pressure drop across the valve of less than about 0.25 Torr (claim 1), 2) has an opening substantially equal in width to an inner surface of the piping and has no projections with respect to the inner surface of the piping (claim 9), or 3) permits a cleaning gas to flow from the remote plasma discharge chamber to the CVD reaction chamber without obstruction?

Findings of Fact

Fong discloses a CVD apparatus (10) comprising a dual input gas mixing block (273) having a process gas supply line (43) inlet including an inner passage (295) through which process gas passes to a CVD chamber (15), and an annular passage (297) in communication with a passage (293) in a cleaning gas conduit (47) for directing cleaning gas into the CVD chamber (15) from a remote plasma system (55) (col. 12, l. 46; col. 13, ll. 31-33; col. 14, ll. 11-15; col. 27, ll. 18-22). The gas cleaning conduit includes, between the remote plasma system (55) and the gas mixing block (273), a gate valve (280) used to control whether the gas entering the CVD chamber (15) is process gas through the process gas supply line (43) or cleaning gas through the cleaning gas conduit (47) (col. 13, ll. 35-38; col. 16, ll. 42-45; col. 26, ll. 49-54; Fig. 1A).

Hartman discloses a gate valve which, when open, has no inner projection with respect to the inner surface of a pipe in which the valve is positioned (Fig. 4).¹

Analysis

Claims 1 and 9

The Appellants argue, in reliance upon a Declaration under 37 C.F.R. § 1.132 of Kiyoshi Satoh (filed Jan. 16, 2007) (¶ 4), that Fong does not disclose the position of the gate when the valve is fully opened (Br. 22; Reply Br. 2). The Appellants point out that Shang discloses a CVD apparatus having, between a remote plasma chamber (46) and a deposition chamber (10), a flow restrictor (59), e.g., a small orifice, a reduction valve or a needle valve, which provides a pressure differential between the remote

¹ A discussion of Lorimer, Ikeda, Noble and Iyer is not necessary to our decision.

plasma chamber (46) and the deposition chamber (10) (col. 4, ll. 48-52; col. 5, ll. 25-28; Fig. 1). The Appellants also point out that Sun discloses a similar flow restrictor (62) (§ 0013, Fig. 1), Rajagopalan discloses a flow control mechanism (80, 82) between a supply (86, 84) of gas to be activated and a CVD processing chamber (10) (col. 6, ll. 45-51; Fig. 1), Yin discloses an activated cleaning gas flow control valve (225) (p. 16, ll. 19-20; Fig. 4) and Fukuda discloses flow block valve (15) between a remote plasma discharge chamber (16) and a CVD reaction chamber (2) (§ 0070; Fig. 2) (Br. 13-14, 17). The Appellants argue that “[t]hus, there are a number of references that not only teach that a valve designed and configured for restriction or control should be used, but explicitly teach that this ability to restrict or control the flow of the gas is an important aspect that a valve should possess. The skilled artisan would understand these teachings to steer away from the presently recited type of valve” (Br. 13-14).

Shang uses a flow restrictor (59) such as a small orifice, a reduction valve or a needle valve to provide a pressure differential between a remote chamber (46) and a deposition chamber (10) (col. 4, ll. 48-52; col. 5, ll. 25-28). Fong uses a different type of valve for a different purpose. Fong’s valve (280) is a gate valve and is used to select which of two alternate gases (process gas or cleaning gas) is fed to a CVD chamber (15) (col. 13, ll. 34-37).² Fong’s disclosure regarding opening the gate valve (280) to provide

² Fong’s gate valve likewise differs from Sun’s flow restrictor (62) (§ 0013) and the flow control valves of Rajagopalan (82, 84 (col. 6, ll. 45-48) and Yin (225, p. 16, ll. 19-20). Fukuda does not disclose that the valve (15) between the remote plasma discharge chamber (16) and the CVD reaction chamber (2) restricts or controls flow but, rather, merely discloses that the

cleaning gas flow during chamber cleaning does not indicate that the cleaning gas flow rate is to be restricted (*see, e.g.*, col. 37, ll. 54-59; col. 41, ll. 14-17). Fong does not show the gate valve (280)'s plug (col. 26, ll. 49-52) but, rather, illustrates the opened gate valve (280) only schematically (Fig. 3). The schematic illustration, however, shows an unobstructed pipe cross section at the gate valve (280) (Fig. 3). Hence, Fong would have led one of ordinary skill in the art, through no more than ordinary creativity, to use a gate valve which, when fully open, provides an unobstructed pipe cross section to avoid unnecessary interference with the cleaning gas flow to the CVD chamber (15). *See KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (In making an obviousness determination one "can take account of the inferences and creative steps that a person of ordinary skill in the art would employ").³

The Appellants argue that Fong's inner passage (295) of the process gas supply line (43) appears to provide a restriction of the flow of cleaning gas, and given that apparent flow restriction one of ordinary skill in the art would have assumed that a gate valve which opens only partially would perform as well as one which opens fully (Br. 14, 19; Reply Br. 4). The Appellants argue that "Fong appears to teach that the flow path between the two chambers can and should be restricted, at least in the mixing block" (Br. 14).

Even if there is some flow restriction at the inner passage (295) of Fong's process gas supply line (43), Fong does not indicate that one of

valve (15) is closed during thin film forming and processing of the workpiece (¶ 0070).

³ Such a gate valve is shown by Hartman (Fig. 4).

ordinary skill in the art should disregard the benefit of minimizing flow restrictions and the associated pressure drop elsewhere in the line. The Appellants have provided mere attorney argument to the contrary, and such argument of counsel cannot take the place of evidence. *See In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *In re Payne*, 606 F.2d 303, 315 (CCPA 1979); *In re Greenfield*, 571 F.2d 1185, 1189 (CCPA 1978); *In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974).⁴

Claim 19

The Appellants argue that the exit of Fong's mixing block (273) is obstructed by the inner passage (295) of the process gas supply line (43), and that the mixing box itself appears to restrict flow (Reply Br. 6). The Appellants argue that Fong's "mixing block would need to be removed to obtain an arrangement that was 'without obstruction' as recited in [claim 19]" (Reply Br. 6).

"[D]uring examination proceedings, claims are given their broadest reasonable interpretation consistent with the specification." *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1256 (Fed. Cir. 2007), quoting *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000).

The portion of the Appellants' Specification relied upon by the Appellants for written descriptive support for claim 19 (Br. 7) states that

⁴ The Appellants' claim 1 requires that "the valve has an opening that, when fully open, defines a pressure drop across the valve of less than about 0.25 Torr". The Appellants do not explain, and it is not apparent, why, if the pipe and valve are sufficiently large and the cleaning gas flow rate is sufficiently low, that claim requirement would not be met even by a gate valve which, when fully open, does not provide a completely unobstructed pipe cross section.

“the valve 15 is characterized in that no structure to restrict the flow exists within the passage when it is open” (¶ 0095). Thus, the broadest reasonable interpretation of “when the valve is open, a cleaning gas can flow from the remote plasma discharge chamber to the reaction chamber without obstruction” in claim 19 is that when the valve (15) is open there is no structure in the passage through the valve (15) which provides an obstruction to flow. As discussed above regarding claims 1 and 9, Fong would have led one of ordinary skill in the art, through no more than ordinary creativity, to use such a valve to avoid unnecessary interference with the cleaning gas flow to the CVD chamber (15). *See KSR*, 550 U.S. at 418.

Conclusion of Law

The Appellants have not indicated reversible error in the Examiner’s determination that the applied prior art would have rendered prima facie obvious, to one of ordinary skill in the art, a valve which is positioned in piping which links a CVD reaction chamber and a remote plasma discharge chamber and, when fully open, 1) has an opening defining a pressure drop across the valve of less than about 0.25 Torr (claim 1), 2) has an opening substantially equal in width to an inner surface of the piping and has no projections with respect to the inner surface of the piping (claim 9), and 3) permits a cleaning gas to flow from the remote plasma discharge chamber to the CVD reaction chamber without obstruction.

DECISION/ORDER

The rejections under 35 U.S.C. § 103 of claims 1-3, 5, 6, 8, 9, 15, 16 and 45 over Fong in view of Lorimer and Iyer, claim 10 over Fong in view of Lorimer, Iyer and Ikeda, claims 14 and 17-19 over Fong in view of Lorimer, Iyer and Noble, claims 1-3, 5, 6, 8, 9, 15, 16 and 45 over Fong in

view of Lorimer, Iyer and Hackman, claim 10 over Fong in view of Lorimer, Iyer, Hackman and Ikeda, and claims 14 and 17-19 over Fong in view of Lorimer, Iyer, Hackman and Noble are affirmed.

It is ordered that the Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

tc

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